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Consulting Engineering Geologist

August 27, 1999 Project No. 4457-99

Mr. Robert E. Atkinson
White Mountain Estates
A Limited Partnership
13225 Philadelphia Street
Whittier, CA 90601

SUBJECT: FAULT AND SEISMIC INVESTIGATION FOR PROPOSED RESIDENTIAL DEVELOPMENT
Tract 37-16
Mono County, California

Pursuant to your request, the accompanying report of a fault and seismic investigation of the subject site has been prepared.

If you have any questions regarding the information presented in this report, please contact my office.

Respectfully Submitted,

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INTRODUCTION

PURPOSE

The purpose of this investigation was to obtain information pertaining to whether fault traces trend through the site. The northeasterly portion of the site is located within an Alquist-Priolo Special Studies Zone because the site is in close proximity to the White Mountains Fault Zone. Portions of the White Mountains Fault Zone have been historically active. It is understood that it is proposed to construct several single family detached dwellings on the site.

The fault trenches excavated during this investigation were placed in such a manner that they would intercept traces of the White Mountains fault that might trend through the site.

SCOPE OF WORK

The scope of work performed for this investigation included the following items:

- Gathering and review of published and unpublished reports and maps pertaining to the geologic conditions on the site and in the surrounding area.
- Subsurface exploration consisting of five exploratory trenches. The trenches were excavated with a large "excavator backhoe".
- Preparation of this report with maps, trench logs, and other graphics to present the findings and recommendations.

SITE DESCRIPTION

The site is located in the southerly portion of Mono County an estimated 6.5 miles northerly of the town of Laws. The approximate geographic location of the site is shown in the lower left corner of Plate 1 (Plate 1 is included in the pocket at the back of this report).

The site (Tract 37-16) is essentially undeveloped. The neighboring tract to the west (Tract 37-15) is developed with detached single family dwellings.

The site slopes relatively gently westerly. Unpaved roads trend through portions of the site.

GEOLOGY

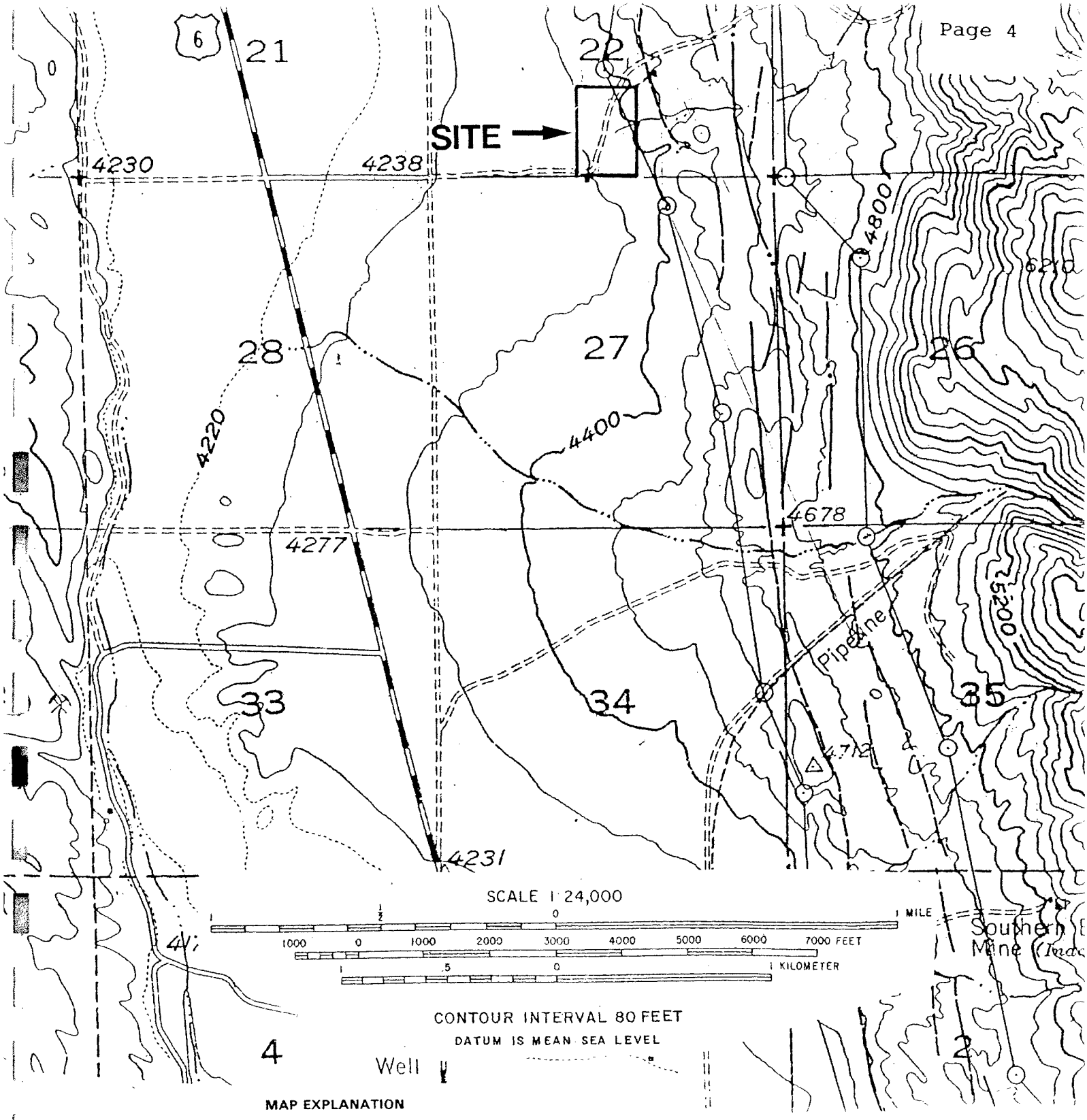
The site is located along the westerly margin of the White Mountains fault zone. Portions of the White Mountains fault zone have been active in historical time. It is likely that the White-Inyo mountains are, at least in part, being uplifted along the fault zone. The White Mountains fault zone should be considered an active fault.

The site is located on the NE 1/4 of the Bishop 15 minute series Quadrangle. The northeasterly portion of the site is located in an Alquist-Priolo Special Studies Zone. Such Special Studies Zones have been designated along known active faults in California under the Alquist Priolo Special Studies Act which was signed into law March 7, 1973. The purpose of this act is to prohibit the location of structures for human occupancy across traces of active faults. Figure 1 shows the location of the site relative to the boundaries of the Special Studies Zone.

The Special Studies Zone map (NE 1/4 of the Bishop Quadrangle) shows a dashed trace of the White Mountains fault system as trending in a northerly-southerly direction about 180 feet easterly of the northeast corner of the site (refer to Plate 1 in pocket at back of this report and to Figure 1).

The area of the proposed improvements is underlain by alluvium. The alluvium generally appeared firm. About 2 to 3 feet of what appeared to be soil mantles the alluvium observed in the trenches.

The alluvium generally consists of brown silty clayey sand and gravel. Clasts range from granule and pebble size to boulder size. The alluvium is described in the sketch logs of the exploratory trenches. The sketch logs are included in the Appendix of this report.



MAP EXPLANATION

Potentially Active Faults

1906 C

Faults considered to have been active during Holocene time and to have a relatively high potential for surface rupture; solid line where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed; query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by creep or possible creep.

Special Studies Zone Boundaries

These are delineated as straight-line segments that connect encircled turning points so as to define special studies zone segments.

Seaward projection of zone boundary.

FIGURE 1

Fault Trenches 4 and 5 were excavated within the portion of the property located in the Alquist-Priolo Special Studies Zone. Trench 5 was excavated across a "break-in-slope". No faults were found in the trenches. The break-in-slope is attributed to alluvial processes.

Although most of the site is not located within the Alquist-Priolo Special Studies Zone, Fault Trenches 1, 2 and 3 were excavated across subtle breaks in slope. No faults were found.

No features were observed in the trenches which indicate a fault or fault traces trend through the site. Based on my site observations, review of maps and information obtained from the trenches, it is my opinion that no active faults trend through the site.

It is important to recognize that the site is located in close proximity to an active fault zone. During the next major earthquake on the White Mountains Fault in the site area, it is likely the site will be subjected to severe ground shaking.

EARTHQUAKE HAZARDS

As previously indicated, the site is located in close proximity to an active fault zone and is located in an area that is very tectonically active. Two major potential hazards associated with active faults which could have a direct influence on the site are surface ground rupture and very severe ground shaking. It is likely that for sites influenced by earthquakes, the most severe damage to structures will result from ground motion (shaking) and permanent ground deformation as opposed to ground ruptures.

The effects of ground rupture or ground cracking resulting from earthquakes can have profound significance for buildings, including single-family dwellings such as proposed for the site. Earthquakes in California can be accompanied by surface ruptures or severe ground cracking. Surface faulting is rarely confined to a simple narrow line nor is it necessarily restricted to known or identified fault traces. During the San Fernando, Landers, and Northridge earthquakes, a relatively wide zone of fault breakage occurred where no faults had previously been recognized. The significance of this information with regard to the site is that it indicates that when an earthquake occurs, ground ruptures may not necessarily be confined to known fault traces, but rather could occur almost anywhere in the vicinity of the causative fault, including at locations where no known faults exist.

Lurching is a phenomenon associated with strong earthquakes whereby the ground is disturbed and cracked by earthquake oscillations. This phenomena is poorly understood and thus difficult to predict. Factors such as topography and groundwater may play an important role. Although numerous lurch effects should be expected in the near field during a large earthquake, these effects generally have not been known to cause catastrophic failures or structural collapse.

Areas in proximity to active faults can be uplifted or can subside if significant earthquakes occur. The subsidence can result from either crustal depression or from compacting of granular, cohesionless sediments. Uplift or subsidence can change the existing slope angles. Generally, these changes occur over large areas and are minor with respect to a small site. Such tilts generally are not of a life-threatening nature. A typical effect might be that drainage ditches no longer drain as well as originally intended. There is little that can be done to prevent such effects and the usual procedure is to correct the damage after the event.

Severe shaking from earthquakes has been known to weaken natural slopes causing slope failures. These failures can undermine buildings, overrun people and structures, block roads, and sever lifelines such as water pipes, power lines, and gas lines. Whether a particular slope produces a failure during an earthquake depends on the strength of the hillside materials, the slope geometry, the groundwater conditions, and the degree of shaking. It does not appear that major grading will be performed in conjunction with the proposed improvements. No major slopes are present in the immediate area of the proposed improvements. As such, the risk of major slope failures influencing the proposed improvements appears very low.

RECOMPACTION OF TRENCH EXCAVATION

Five fault trenches were excavated on the site during this investigation. Although the trenches were filled and compacted by driving an excavator over the filled excavation, the trench backfill could be subject to settlement.

If trench backfill is encountered during excavation for foundations, loose earth materials should be removed and compacted or foundations should be designed to span across the trench backfill.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

The conclusions and recommendations contained in this report are based on information provided to this consultant, information gathered, geologic evaluations, experience, and professional judgment. The recommendations contained in this report should be considered minimums consistent with industry practice. Some degree of risk is associated with any development. More rigorous criteria could be adopted if lower risk of future problems is desired. Usually, the lowest risk is associated with the greatest cost of development.

It is important to recognize that considerable risk is associated with any site located in, or in close proximity to, an active fault zone. Although the risk of ground ruptures directly affecting the proposed development can be reduced by avoiding building across known active or potentially active faults, the possibility of ground ruptures occurring anywhere in proximity to an active fault cannot be ruled out.

It is important to recognize that, it is likely, the greatest damage resulting from an earthquake in the site area will be from severe ground shaking and possible permanent ground deformation. The White Mountains fault is an active fault and it is possible a major earthquake could occur on the fault in the site area during the life of the proposed structures.

It does not appear that any major grading is anticipated in conjunction with the proposed construction.

FOUNDATIONS

The sole purpose of this investigation is to evaluate the site with regard to the potential for ground ruptures influencing the proposed development. Any information pertaining to foundation design criteria or suitability of on-site materials for foundation support should be provided by the project soils engineer.

FAULT-RUPTURE

No faults were identified in the exploratory trenches. As such, it does not appear the proposed structures will be constructed across fault traces. This will reduce the risk of ground ruptures directly influencing the proposed structures.

GROUND MOTION

Because the site is located in close proximity to an active fault system, the site could be subjected to high ground accelerations. The White Mountains Fault is capable of producing at least a 7.1 magnitude earthquake. Peak ground accelerations of 0.6g or higher could be anticipated. The possibility of higher accelerations cannot be ruled out.

ADDITIONAL CONSULTING

Any additional consulting, such as for foundation reviews, grading reviews, response to review sheets, etc., will be performed on a time and expense basis.

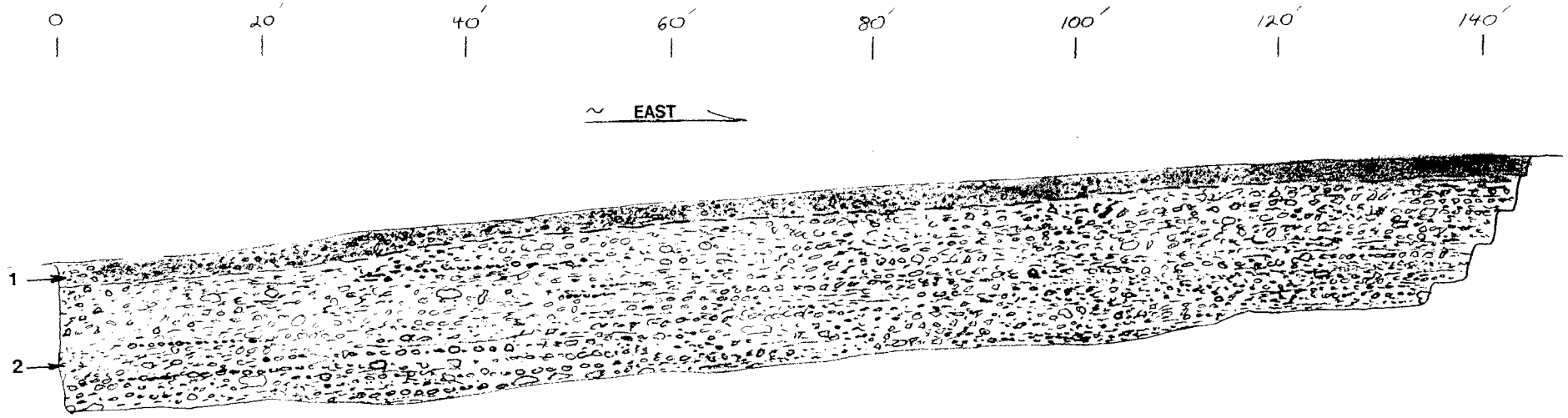
COMMENTS

The conclusions and recommendations presented in this report are based on research, site observations and limited subsurface information. The conclusions and recommendations presented are based on the supposition that subsurface conditions do not vary significantly from those indicated. Although no significant variations in subsurface conditions are anticipated, the possibility of significant variations cannot be ruled out. If such conditions are encountered, this consultant should be contacted immediately to consider the need for modification of the project.

This report is subject to review by regulatory agencies and these agencies may require their approval before the project can proceed. No guarantee that the regulatory public agency or agencies will approve the project is intended, expressed or implied.

One of the purposes of this report is to provide the client with advice regarding geologic conditions on the site. It is important to recognize that other consultants could arrive at different conclusions and recommendations. No warranties of future site performance are intended, expressed or implied.

APPENDIX



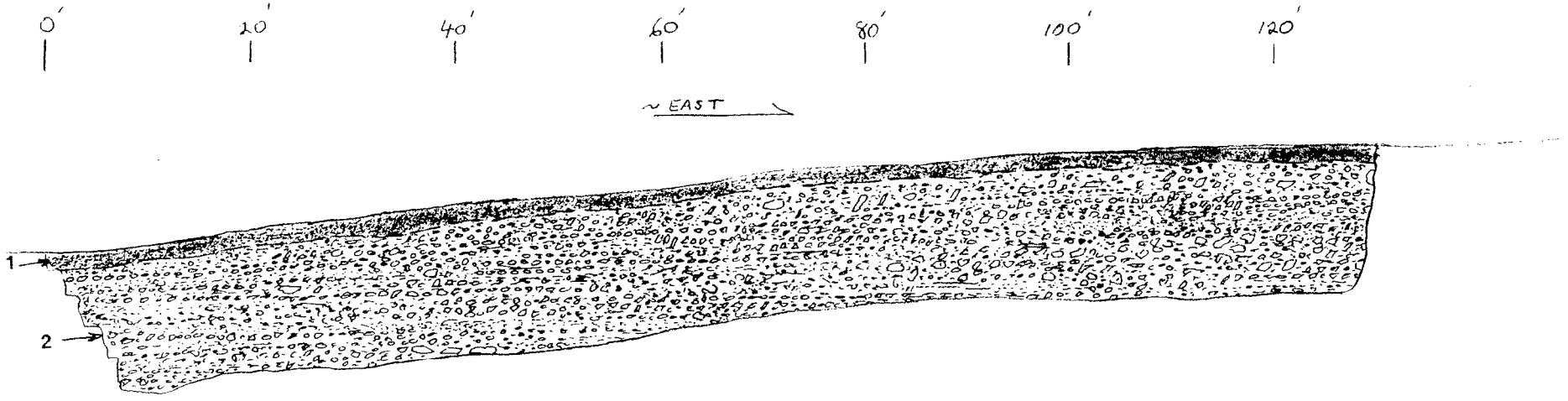
1 **SOIL:** Light brown silty clayey sand, very loose, dry, scattered pebbles and cobbles, some boulders, scattered roots and rootlets.

2 **ALLUVIUM:** Silty clayey sand and gravel, brown, clasts range from subround to angular and from pebble to cobble size with some boulders. Poor to moderately well defined sub-horizontal layering. Layering defined by textural changes. Some imbrication of clasts. No faults, shears, or fissures observed.

SKETCH LOG OF FAULT TRENCH 1

SCALE 1" = 10'

P.N. 4457-99



lithologic descriptions provided on sketch log for fault trench 1

SKETCH LOG OF FAULT TRENCH 2

SCALE 1" = 10'

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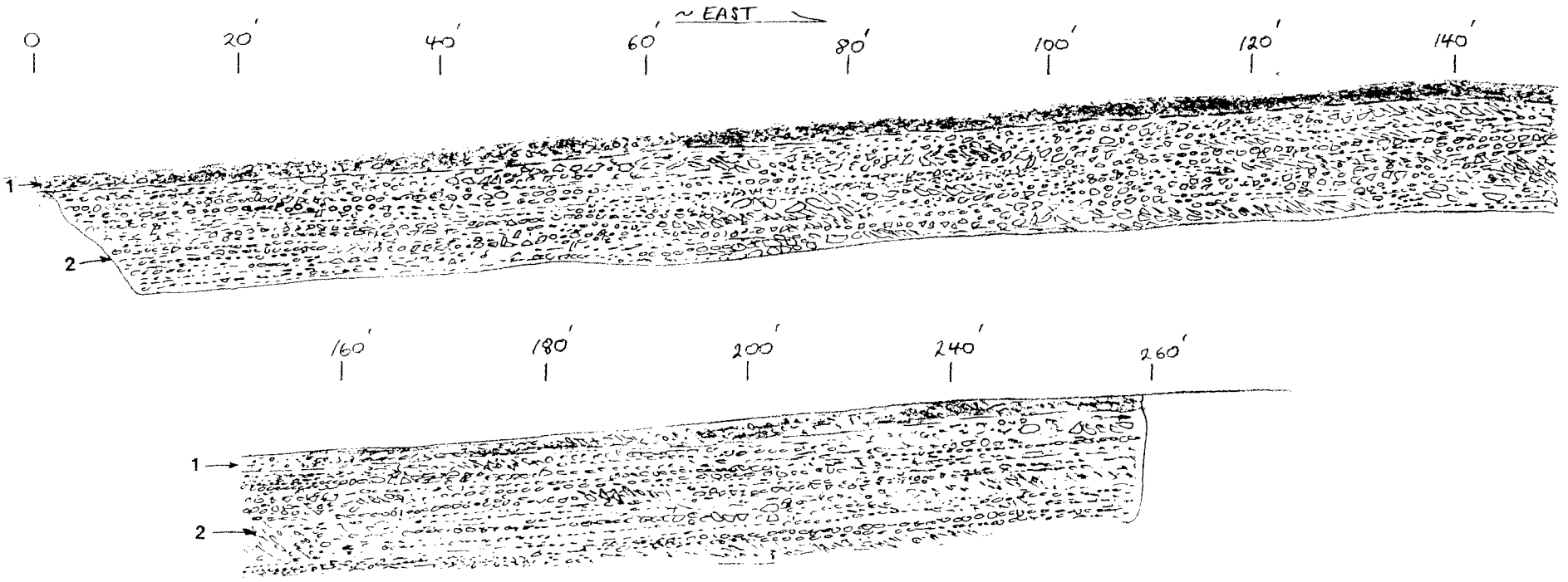

lithologic descriptions provided on sketch log for fault trench 1

SKETCH LOG OF FAULT TRENCH 3

scale 1" = 10'

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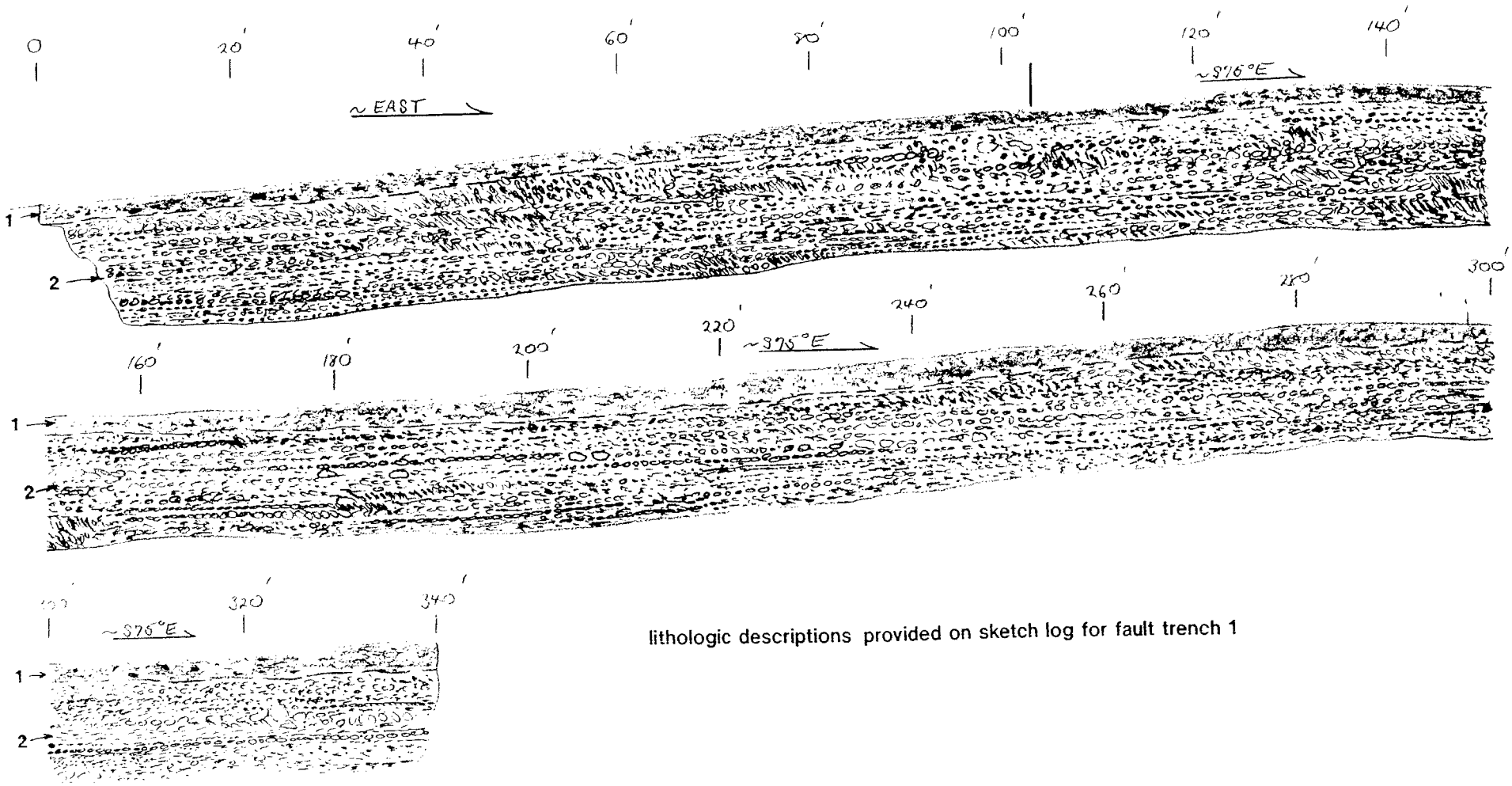

lithologic descriptions provided on sketch log for fault trench 1

SKETCH LOG OF FAULT TRENCH 4

scale 1" = 10'

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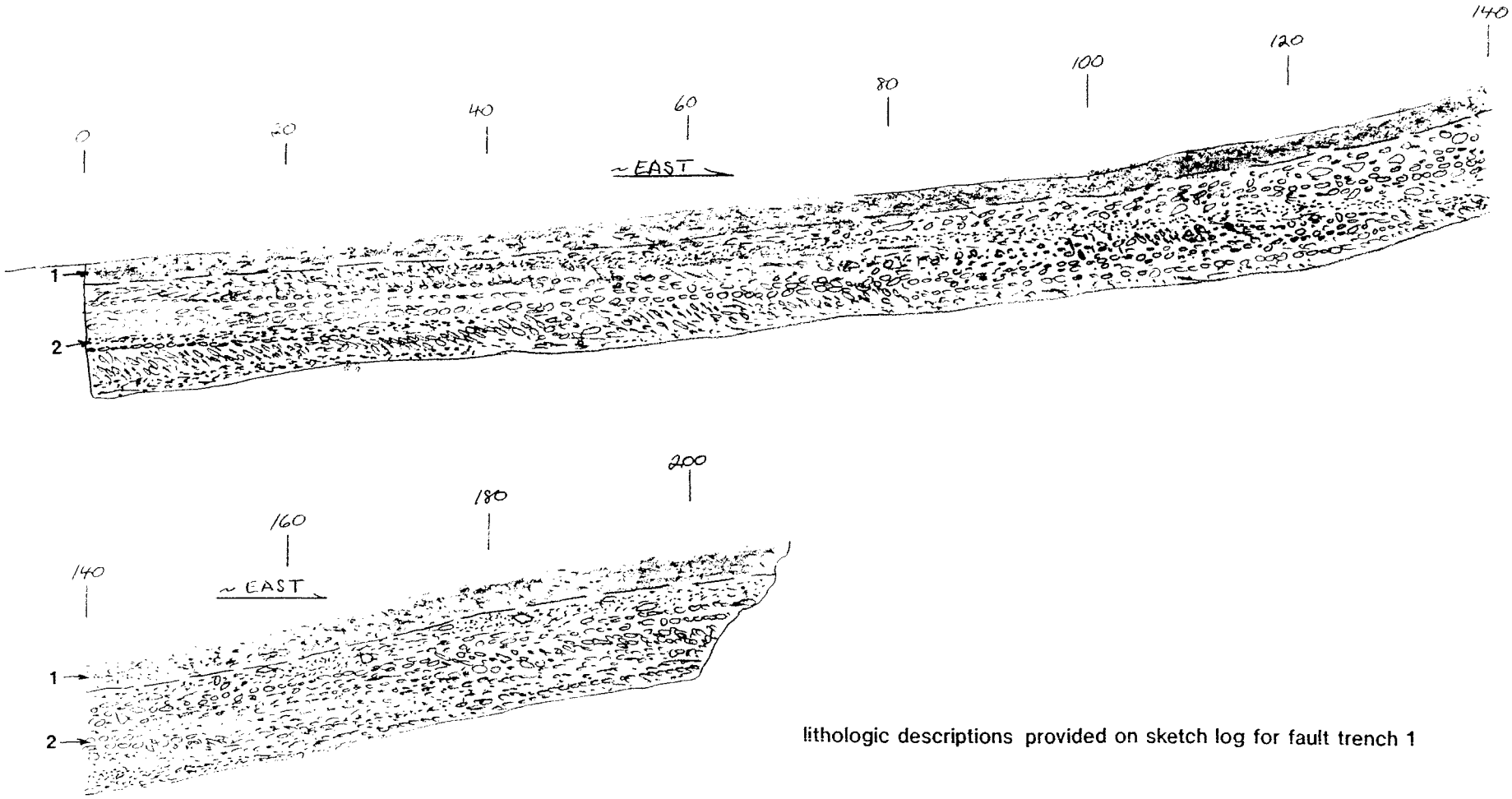

lithologic descriptions provided on sketch log for fault trench 1

SKETCH LOG OF FAULT TRENCH 5

scale 1" = 10'

P.N. 4457-99